CLAIMS

1. A GPS receiver, comprising:

a receiving portion, receiving navigation messages transmitted from a plurality of GPS satellites respectively;

a navigation message analyzing portion, obtaining an ephemeris and an almanac from the received navigation message to restore;

an ephemeris storing portion, storing the obtained ephemeris;

an almanac storing portion, storing the restored almanac;

a clock portion, measuring a time to calculate a current time;

a satellite position calculating portion, calculating positions of the plurality of GPS satellites by using the current time calculated in the clock portion and the obtained ephemeris or the restored almanac; and

a position measuring portion, calculating a position measuring based on the navigation message transmitted from the GPS satellite as a communication object,

wherein the navigation message analyzing portion includes a predicting portion which predicts a time information stored only in a final subframe, which serves as a reference to calculate positions of the plurality of GPS satellites, based on information indicating a lapsed week number on a basis of a predetermined week stored in each main frame of the received navigation message respectively, and a restoring portion which restores the almanac based on the predicted time information which serves as the reference to calculate the positions of the plurality of GPS satellites.

2. A GPS receiver, comprising:

a receiving portion, receiving navigation messages transmitted from a plurality of GPS satellites respectively;

a navigation message analyzing portion, obtaining an ephemeris and an almanac from the received navigation message to restore;

an ephemeris storing portion, storing the obtained ephemeris;

an almanac storing portion, storing the restored almanac;

a clock portion, measuring a time to calculate a current time;

a satellite position calculating portion, calculating positions of the plurality of GPS satellites by using the current time calculated in the clock portion and the obtained ephemeris or the restored almanac; and

a position measuring portion, calculating a position measuring based on the navigation message transmitted from the GPS satellite as a communication object,

wherein the navigation message analyzing portion includes a predicting portion which predicts a time information stored only in a final subframe of the navigation message, which serves as a reference to calculate positions of the plurality of GPS satellites, based on the current time which is calculated in the clock portion, and a restoring portion which restores the almanac based on the predicted time information which serves as the reference to calculate the positions of the plurality of GPS satellites.

3. The GPS receiver according to claim 1 or 2, further comprising:

a portion, predicting a Z count stored in respective subframes of the navigation message based on the current time which is calculated in the clock portion; and

a deciding portion, deciding that the restored almanac is abnormal when a difference between the predicted Z count and the Z count stored in the subframes of the navigation message exceeds a predetermined threshold value.

4. The GPS receiver according to claim 3, wherein the satellite position calculating portion includes a first satellite position calculating portion which calculates positions of the plurality of GPS satellites by using the almanac stored in the almanac storing portion, and a second satellite position calculating portion which calculates positions of the plurality of GPS satellites by using the almanac which is restored on a basis of the predicted time information which serves as the reference to calculate the positions of the plurality of GPS satellites, and

the GPS receiver, further comprising:

a deciding portion, deciding that the restored almanac is abnormal when a difference between positions of the GPS satellites calculated by the first satellite position calculating portion and the second satellite position calculating portion exceeds a predetermined threshold value.

5. The GPS receiver according to claim 1 or 2, wherein the satellite position calculating portion includes a first satellite position calculating portion which calculates positions of the plurality of GPS satellites by using the ephemeris which is stored in the ephemeris storing portion, and a second satellite position calculating portion which calculates positions of the plurality of GPS satellites by using the almanac which is restored on a

basis of the predicted time information that serves as the reference to calculate the positions of the plurality of GPS satellites, and

the GPS receiver, further comprising:

a deciding portion, deciding that the restored almanac is abnormal when a difference between positions of the GPS satellites calculated by the first satellite position calculating portion and the second satellite position calculating portion exceeds a predetermined threshold value.

6. The GPS receiver according to claim 1 or 2, further comprising:

a Doppler-shift frequency calculating portion, calculating Doppler-shift frequencies of signals received from the plurality of GPS satellites respectively;

a Doppler-shift frequency predicting portion, predicting a Doppler-shift frequency by using the almanac which is restored by the restoring portion; and

a deciding portion, deciding that the restored almanac is abnormal when a difference between the Doppler-shift frequency predicted by the Doppler-shift frequency predicting portion and the Doppler-shift frequencies calculated by the Doppler-shift frequency calculating portion exceeds a predetermined threshold value.

7. The GPS receiver according to claim 3, further comprising:

a first satellite position calculating portion, calculating the positions of the plurality of GPS satellites by using the almanac which is stored in the almanac storing portion;

a second satellite position calculating portion, calculating positions of the plurality of GPS satellites respectively by using three almanacs which are

restored based on the predicted time information (referred to as WNa hereinafter) which serves as the reference to calculate the positions of the plurality of GPS satellites and WNa-1 and WNa+1 which are obtained by adding/subtracting 1 to/from the WNa respectively; and

a deciding portion, deciding the almanac used to calculate a position, which is closest to a position of the GPS satellite calculated by the first satellite position calculating portion, among three positions of the GPS satellite, which are calculated by the second satellite position calculating portion, as a valid almanac.

8. The GPS receiver according to claim 1 or 2, further comprising:

a first satellite position calculating portion, calculating the positions of the plurality of GPS satellites by using the ephemeris which is stored in the ephemeris storing portion;

a second satellite position calculating portion, calculating positions of the plurality of GPS satellites respectively by using three almanacs which are restored based on the predicted time information (referred to as WNa hereinafter) which serves as the reference to calculate the positions of the plurality of GPS satellites, and WNa-1 and WNa+1 which are obtained by adding/subtracting 1 to/from the WNa respectively; and

a deciding portion, deciding the almanac used to calculate a position, which is closest to a position of the GPS satellite calculated by the first satellite position calculating portion, among three positions of the GPS satellite, which are calculated by the second satellite position calculating portion, as a valid almanac.

9. The GPS receiver according to claim 1 or 2, further comprising:

a Doppler-shift frequency calculating portion, calculating Doppler-shift frequencies of signals received from the plurality of GPS satellites respectively;

a Doppler-shift frequency predicting portion, predicting three Doppler-shift frequencies respectively by using three almanacs which are restored based on the predicted time information (referred to as WNa hereinafter) which serves as the reference to calculate the positions of the plurality of GPS satellites, and WNa-1 and WNa+1 which are obtained by adding/subtracting 1 to/from the WNa respectively; and

a deciding portion, deciding the almanac used to predict the Doppler-shift frequency, which is closest to the Doppler-shift frequency calculated by the Doppler-shift frequency calculating portion, among the three Doppler- shift frequencies, which are predicted by the Doppler-shift frequency predicting portion, as a valid almanac.

10. The GPS receiver according to claim 1 or 2, further comprising:

a time calculating portion, calculating a time based on the predicted time information which serves as the reference to calculate the positions of the plurality of GPS satellites and time information stored in respective main frames of the navigation message to indicate a second number lapsed from a head of a week; and

a correcting portion, correcting the predicted time information which serves as the reference to calculate the positions of the plurality of GPS satellites such that the time calculated by the time calculating portion is below

3.5 days rather than the current time calculated by the clock portion.

11. The GPS receiver according to claim 1 or 2, wherein the time information indicating the second number lapsed from a head of a week is stored in a subframe, in which the almanac is stored, of respective main frames of the navigation message; and

wherein the previously predicted WNa is used as the time information with respect to the almanac which contains the time information indicating the second number lapsed from the head of a same week, instead of repeating a prediction of the time information serving as the reference to calculate the positions of the plurality of GPS satellites.

12. A GPS receiver, comprising:

a receiving portion, receiving navigation messages transmitted from a plurality of GPS satellites respectively;

a navigation message analyzing portion, obtaining an ephemeris and an almanac from the received navigation message to restore;

an ephemeris storing portion storing the obtained ephemeris;

an almanac storing portion, storing the restored almanac;

a clock portion, measuring a time to calculate a current time;

a satellite position calculating portion, calculating positions of the plurality of GPS satellites by using the current time calculated in the clock portion and the obtained ephemeris or the restored almanac; and

a position measuring portion, calculating a position measuring based on the navigation message transmitted from the GPS satellite as a

communication object,

wherein the almanac is formed on the basis of the obtained ephemeris.